

**REMARKS**

Pursuant to the present amendment, claim 30 is amended to include the limitation of its dependent claim 31, which is canceled without prejudice. By way of this amendment claims 1-3, 5-8, 10-15, 18, 23-30 and 32-34 are pending in the instant application. Applicants respectfully request reconsideration of the application in view of the remarks set forth below.

In the Office Action, claims 1-3, 5-8, 10-15, 18 and 23-34 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Japanese Patent document 2000-269178 *Yamazaki*, et al. (*Yamazaki*). Applicants respectfully traverse the Examiner's rejections.

As the Examiner well knows, an anticipating reference by definition must disclose every limitation of the rejected claim in the same relationship to one another as set forth in the claim. *In re Bond*, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). Under this legal principle, it is respectfully submitted that all pending claims are in condition for allowance.

With regard to rejection of claim 1, the instant application sets forth a method, comprising, among other things, removing unwanted material of the metal layer and/or the barrier layer selectively from the edge region of a substrate. A metallization layer stack that comprises the metal and barrier layers is formed at least on a central region of the substrate. The method further includes that a first etchant is applied to remove material of the metal layer and a second etchant is applied to remove material at least of the barrier layer. For example, in one illustrative embodiment depicted in Figure 1C, a first etchant 121 may be configured so as to substantially remove copper. A second etchant may be supplied to the edge region 103. With the second etchant, at least the barrier layer 154 may be removed above the edge region 103. By

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removing the metallization layer 151 that may comprise copper using the first etchant 121 and/or the barrier layer 154 using the second etchant, the probability of copper contamination of the substrate 100 is significantly reduced. See patent application, page 14, lines 1-16.

Contrary to the conventional approach, the present invention is based on the consideration of minimizing the risk of contamination of subsequent processes. In this way, any tiny amounts of metal that may be liberated upon delamination of the barrier layer 154 and/or the dielectric layer 153, at least at the bevel 105, may be minimized so as to not adversely effect subsequent processes. By removing unwanted material including, contrary to the conventional approach, more substrate area may be made available for actual semiconductor devices.

As understood by the undersigned, Yamazaki is generally directed to an etching removal and cleaning method and apparatus. A treating liquid may be spouted from a surface nozzle 14 in a beam shape, or the treating liquid may be ejected ("spouted" according to the translation) in a spraying state. Pure water is ejected from the surface nozzle 14 onto the center section on the front face of the wafer. When ejecting or spraying pure water, an organic acid may be used temporarily to wash the contamination Cu adhering to the front face of a device formation field. See Yamazaki [0081]. Then HF solution is ejected or sprayed from the etch nozzle 18 and the rear-face nozzle 16, and Ta which is the barrier metal 38 is removed from the surface nozzle 14. See Yamazaki at paragraph [0089].

However, Yamazaki is completely silent with regard to removing unwanted material of a metal layer and/or a barrier layer selectively from an edge region of a substrate. Instead, Yamazaki describes removing the barrier metal 38 from the surface nozzle 14. See Yamazaki at

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paragraph [0089]. That is, *Yamazaki* does not disclose or suggest removing unwanted material of the metal layer and/or barrier layer selectively from the edge region of the substrate, as claimed in claim 1. *Yamazaki*, only teaches removal of the metal layer from the wafer 10 and it is completely silent with respect to removal of a barrier layer at the edge region of the substrate, as required by the claims.

The Examiner appears to assert that *Yamazaki* teaches all of the elements claim 1, including removing unwanted material of at least the metal layer and/or the barrier layer selectively from the edge region of the substrate. The Applicants respectfully disagree that *Yamazaki* teaches this feature as set forth in claim 1.

As noted, the Examiner argues that *Yamazaki* teaches a process where a barrier layer and a metal layer which are formed on a semiconductor substrate are sequentially etched to remove the layers from the edge of the wafer. However, as set forth above, *Yamazaki* at [0089] teaches removing the barrier layer 38 from the surface nozzle 14 which ejects pure water onto the front face of a wafer.

In contrast, such as explained in the patent application, in claim 1, unwanted material may be removed selectively from the metal and/or barrier layer(s) at the edge region of the substrate wherein a metallization layer stack comprises the metal and barrier layers that are formed at the central region of the substrate. Thus, contrary to the Examiner assertion, *Yamazaki* at least fails to teach or suggest this removing unwanted material of two different layers selectively from an edge region of the substrate. Accordingly, for this reason, claim 1 and

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dependent claims are allowable. Moreover, other pending claims are also allowable for this reason alone.

For at the least the aforementioned reasons, Applicants' respectfully submit that the present invention is not anticipated by *Yamazaki* and request the Examiner's rejections of claim 1 and claims depending therefrom under 35 U.S.C. §102(b) be withdrawn.

Claim 12 and its dependent claims are also allowable over *Yamazaki* because this reference at least does not teach removing unwanted material of the metal layer and/or the barrier layer(s) selectively from the edge region of the substrate. Claim 23 and its dependent claims are also allowable at least for the similar reasons.

Claim 30 has been amended to include the limitation set forth in its dependent claim 31. By way of this amendment, no new subject matter has been introduced. As amended, claim 30 is likewise allowable over *Yamazaki* for at least the reasons set forth above in the context of claim 1. The Examiner's rejection of the pending claims 1-3, 5-8, 10-15, 18 and 23-34 is respectfully traversed.

For at least the aforementioned reasons, Applicants' respectfully submit that the present invention is not anticipated by *Yamazaki* and respectfully request that the Examiner's rejections of pending claims be withdrawn since these claims are in condition for allowance.

In view of the foregoing, Applicants respectfully submit that all pending claims are in condition for allowance. The Examiner is invited to contact the undersigned at (713) 934-4055 with any questions, comments or suggestions relating to the referenced patent application.

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Respectfully submitted,

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